

Coordinate Geometry Key Points

• Eqn of a straight line : $y - y_1 = m(x - x_1)$

• Can be rearranged to $y = mx + c$ and $ax + by + c = 0$

• For points $A(x_1, y_1)$ and $B(x_2, y_2)$:

$$\text{gradient : } m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\text{mid-point : } \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$\text{Length } AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Lines L_1 and L_2 with gradients m_1 & m_2 :

• $m_1 = m_2 \Rightarrow L_1$ & L_2 are parallel

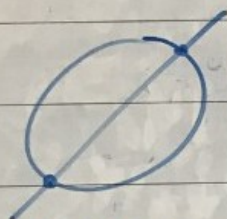
• $m_1 \times m_2 = -1 \Rightarrow L_1$ & L_2 are perpendicular

The ⊥ bisector of $A(x_1, y_1)$ and $B(x_2, y_2)$ passes through the mid-point $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

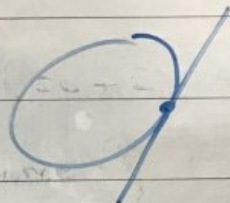
with gradient $-\frac{1}{m_{AB}}$

A circle with centre (a, b) and radius r has equation:

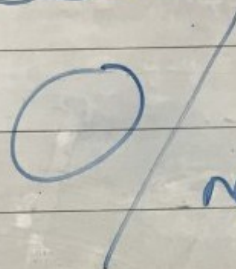
$$(x-a)^2 + (y-b)^2 = r^2$$



2 P.O.I.



1 P.O.I.

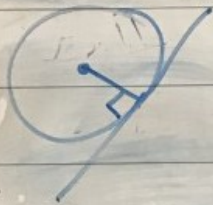


No P.O.I.

Use discriminant analysis to determine the number of P.O.I.

- ① Sub in eqn straight line into circle eqn.
- ② Rearrange to form a quadratic
- ③ Use $b^2 - 4ac > 0$ for 2 P.O.I.
 $= 0$ for 1 P.O.I. (tangent)
 < 0 for none.

Circle Properties

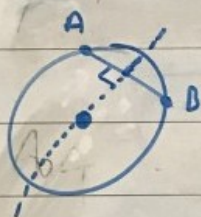


Radius meets tangent at 90° .



Angle in a semi-circle is 90°

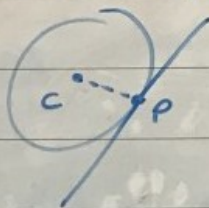
(AC is diameter)



Perpendicular bisector of a chord passes through the centre.

To find eqn of a tangent:

Tangent & Normal are perpendicular



① Find m_{CP}

② Find \perp gradient: $-\frac{1}{m_{CP}} = m_T$

③ Sub in m_T & $P(x_1, y_1)$
into $y - y_1 = m(x - x_1)$